



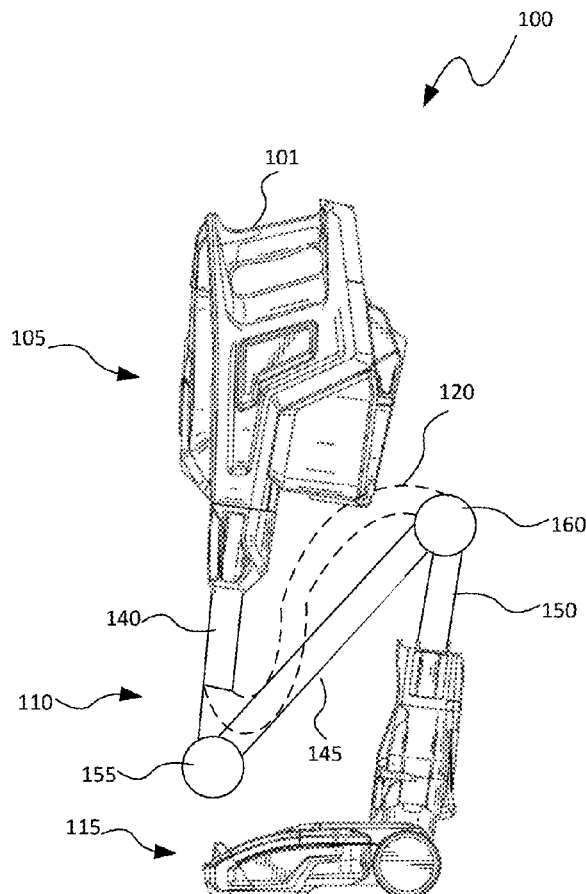
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INNES et al.(10) **Pub. No.: US 2017/0112343 A1**(43) **Pub. Date: Apr. 27, 2017**(54) **VACUUM CLEANING DEVICE WITH
FOLDABLE WAND TO PROVIDE STORAGE
CONFIGURATION****Publication Classification**(51) **Int. Cl.***A47L 9/24* (2006.01)*A47L 9/00* (2006.01)*A47L 5/24* (2006.01)*A47L 5/22* (2006.01)*A47L 9/16* (2006.01)(52) **U.S. Cl.**CPC *A47L 9/248* (2013.01); *A47L 5/225*(2013.01); *A47L 9/1683* (2013.01); *A47L 5/24*(2013.01); *A47L 9/1616* (2013.01); *A47L**9/009* (2013.01)(71) Applicant: **SHARKNINJA OPERATING LLC**,
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Chestnut Hill, MA (US)(21) Appl. No.: **15/333,109**(22) Filed: **Oct. 24, 2016****Related U.S. Application Data**(60) Provisional application No. 62/245,206, filed on Oct.
22, 2015.

(57)

ABSTRACT

Vacuum cleaning devices include foldable wands to provide a storage configuration and/or facilitate use. A vacuum cleaning device includes a wand having a first end coupled to a vacuum unit and a second end coupled to a vacuum head or surface cleaning head. The wand defines an air passage allowing air to pass from the surface cleaning head to the vacuum unit and includes a flexible air passage along at least a portion of the wand. The wand also includes a plurality of segments pivotably connected together such that the wand is foldable about 180° in a forward direction until the vacuum unit is positioned proximate a top of the surface cleaning head, thereby providing a storage configuration.



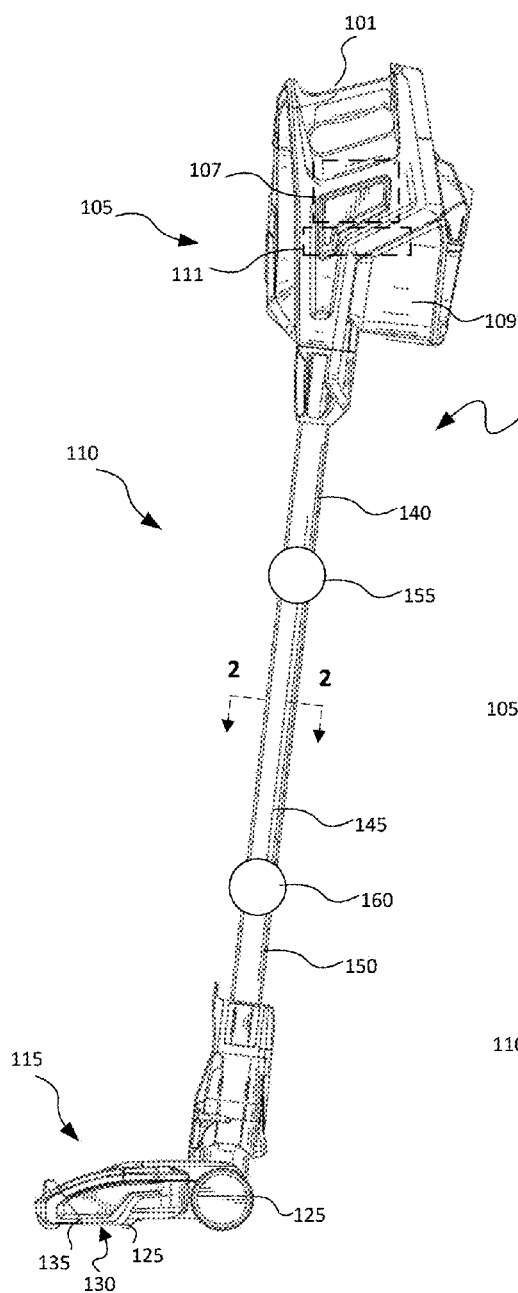


FIG. 1A



FIG. 2

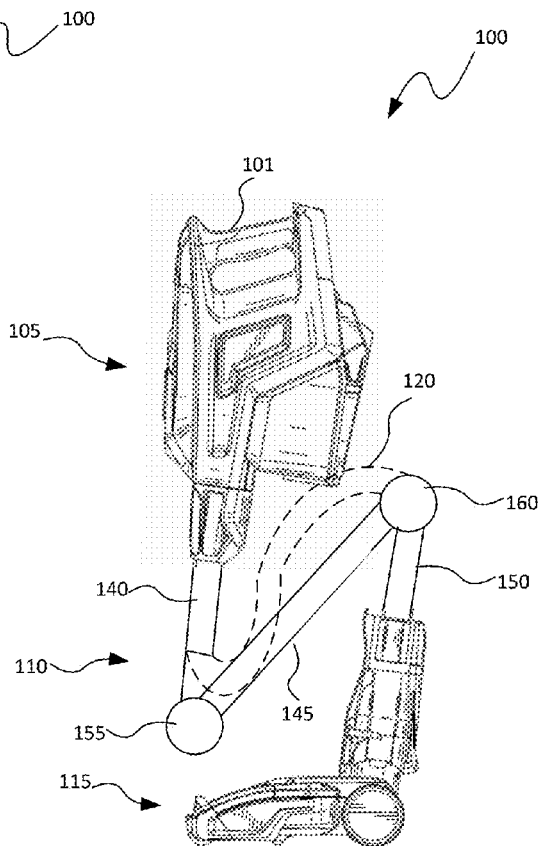


FIG. 1B

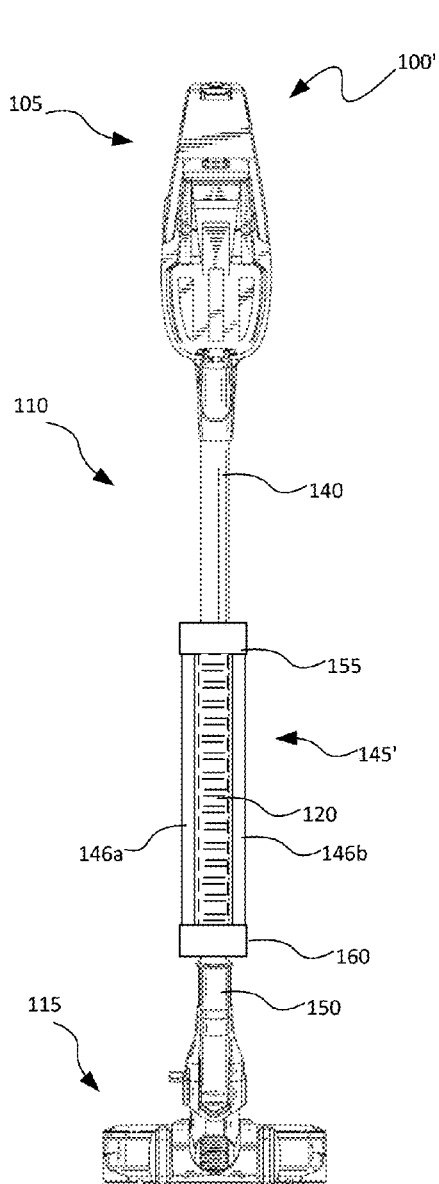


FIG. 3

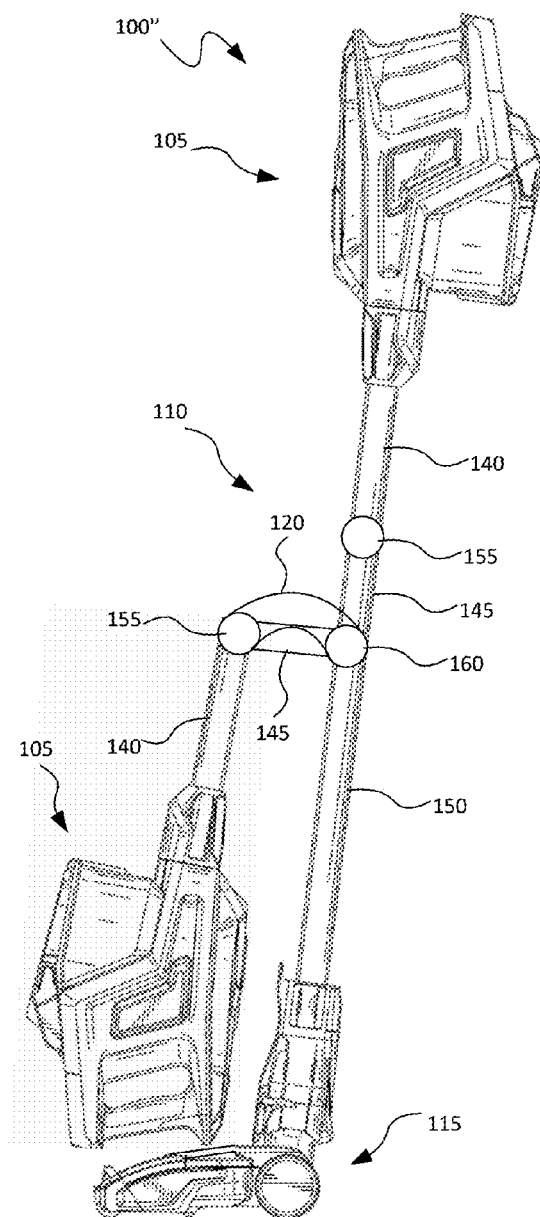


FIG. 4

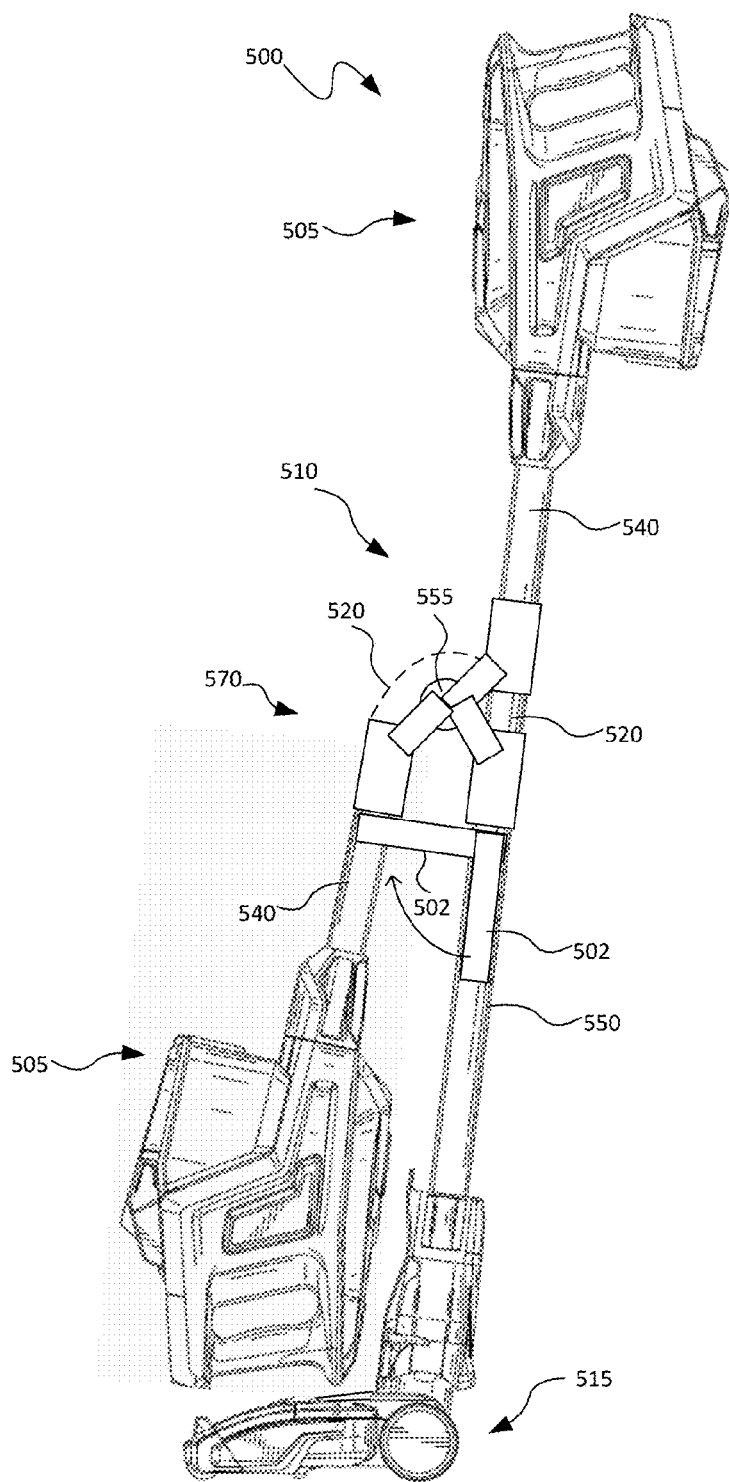


FIG. 5

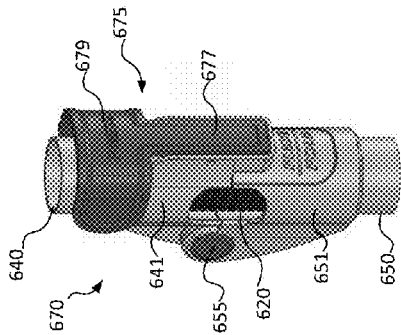


FIG. 6A

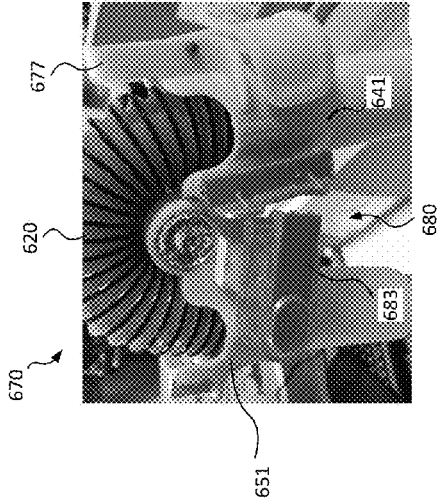


FIG. 6C

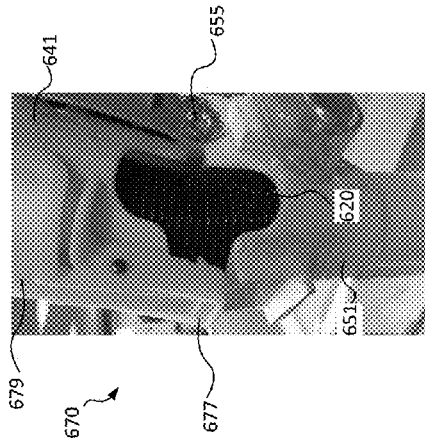


FIG. 6B

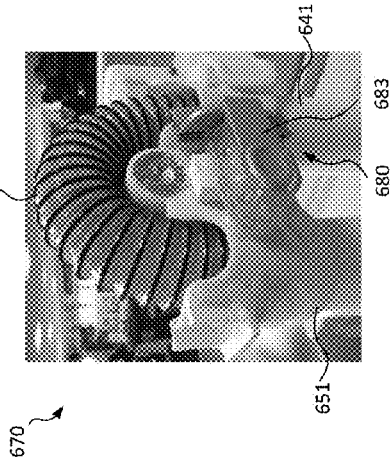


FIG. 6D

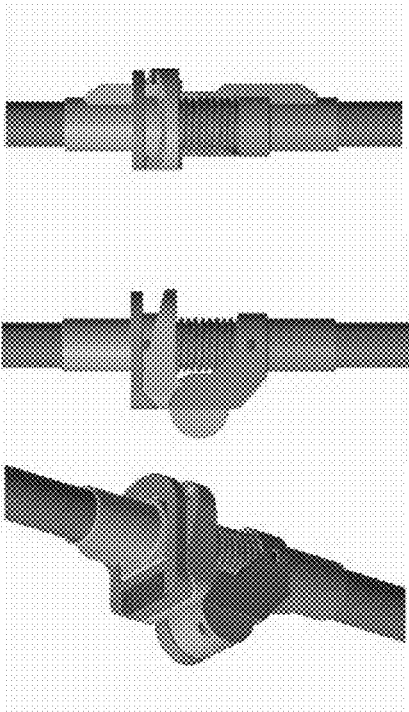


FIG. 7C

FIG. 7B

FIG. 7A

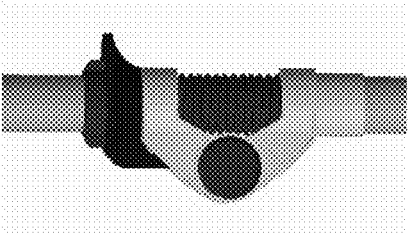


FIG. 9B

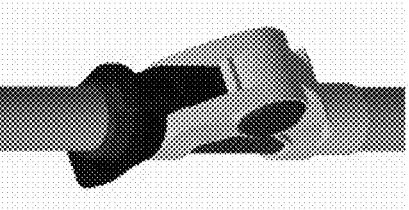


FIG. 9A

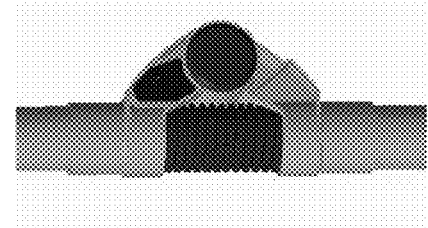


FIG. 8B

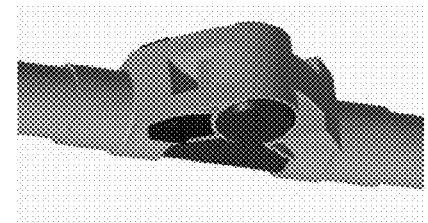


FIG. 8A

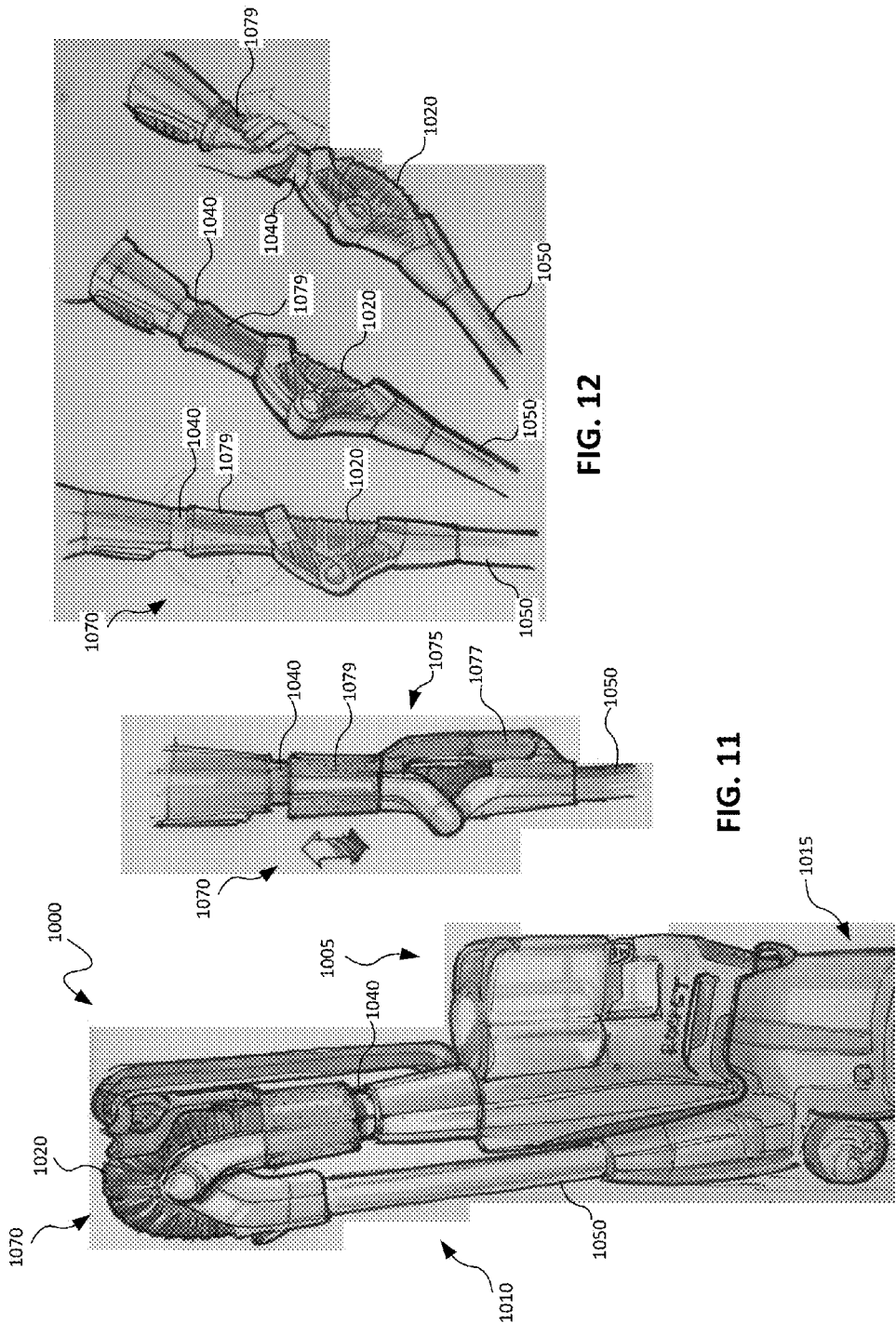


FIG. 12

FIG. 11

FIG. 10

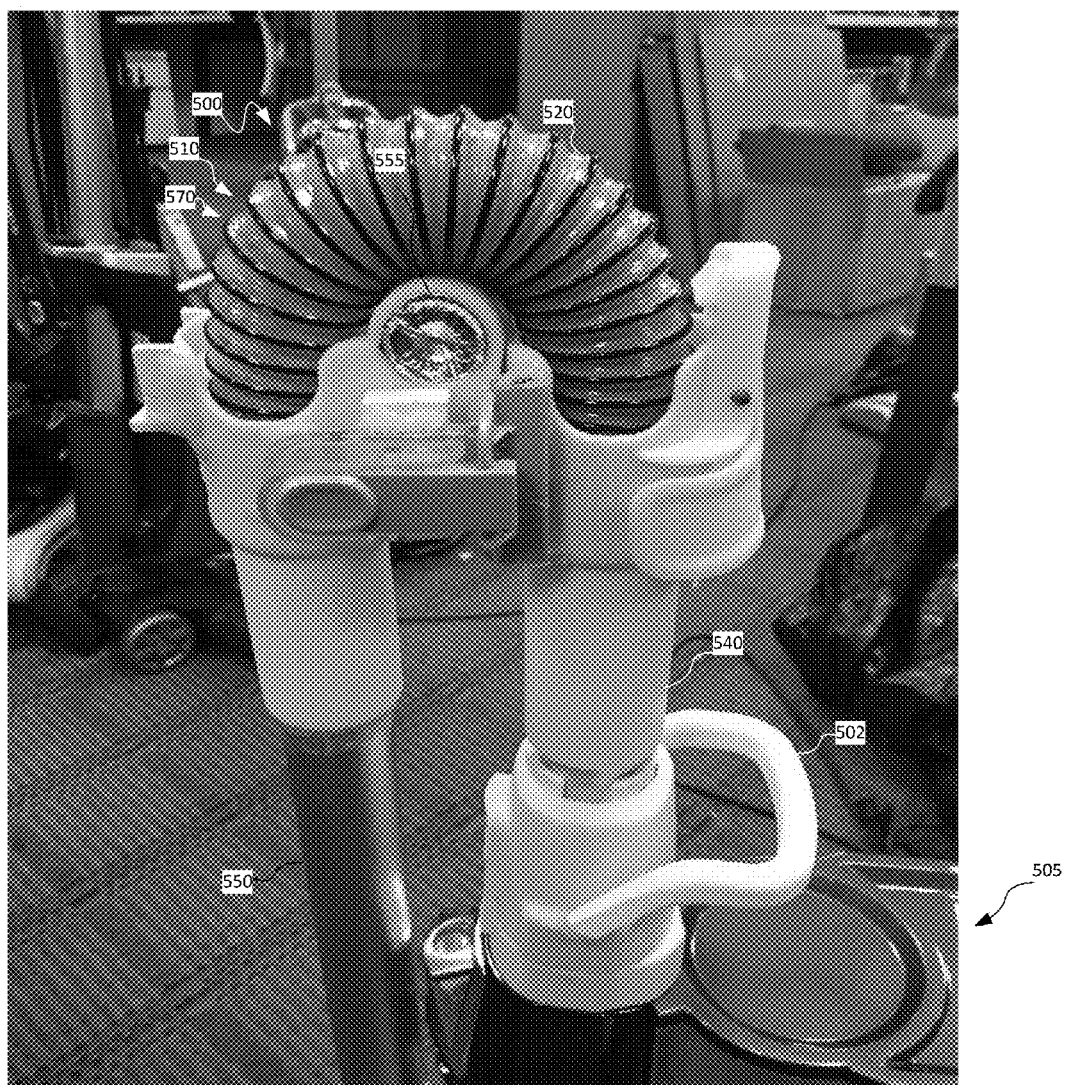


FIG. 13

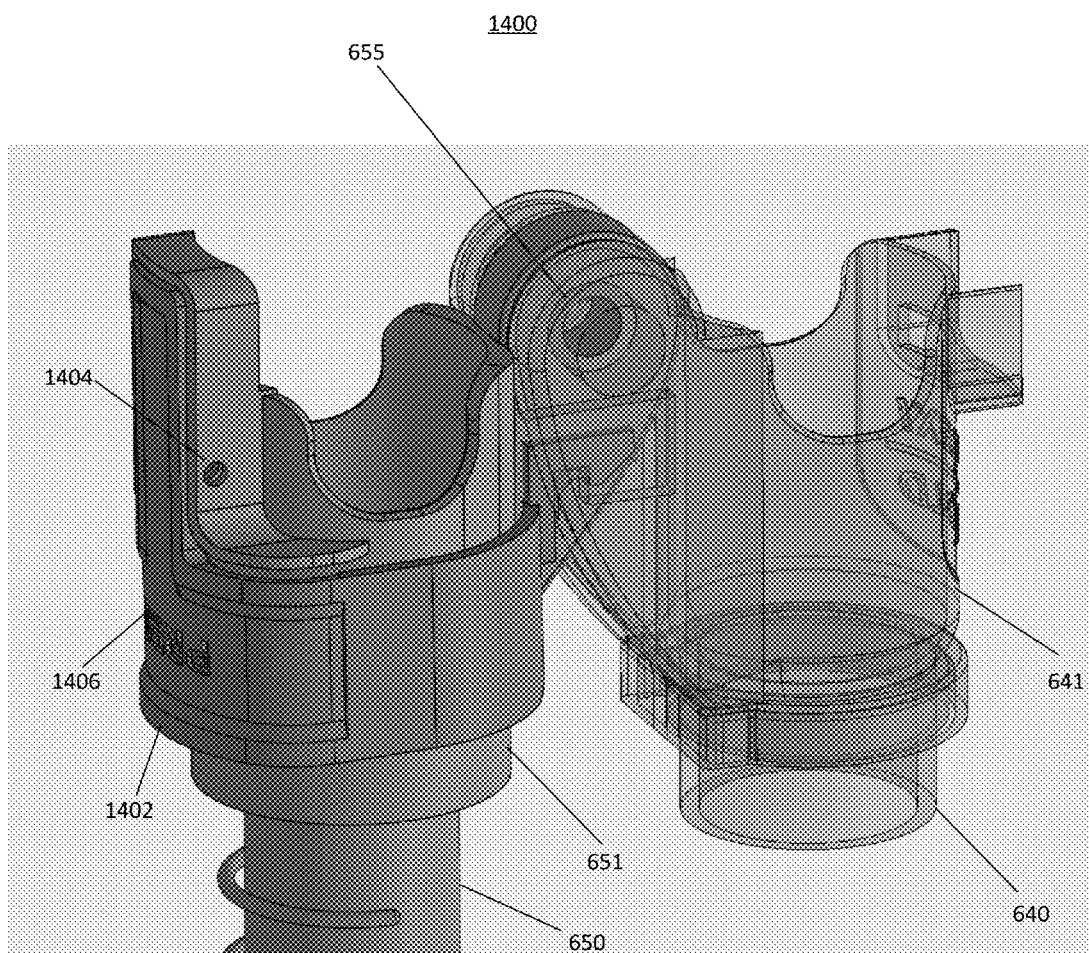


FIG. 14

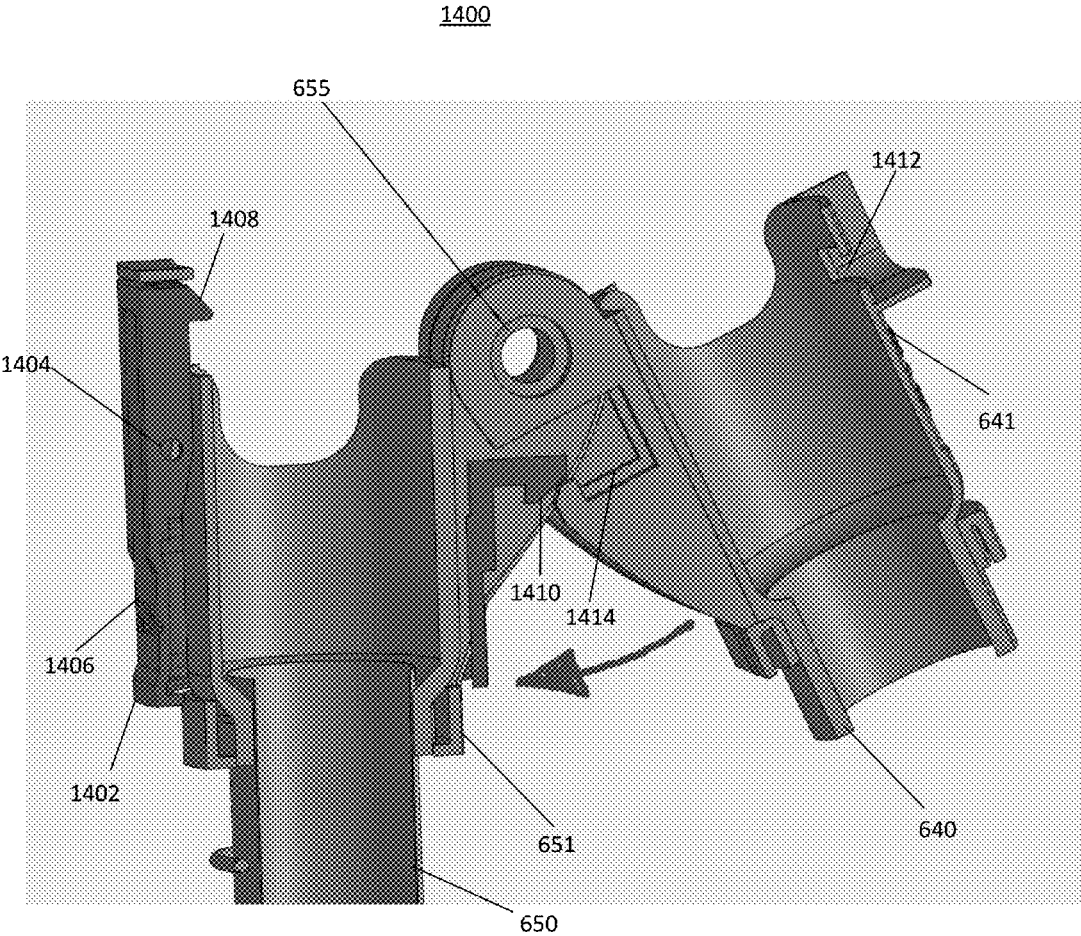


FIG. 15

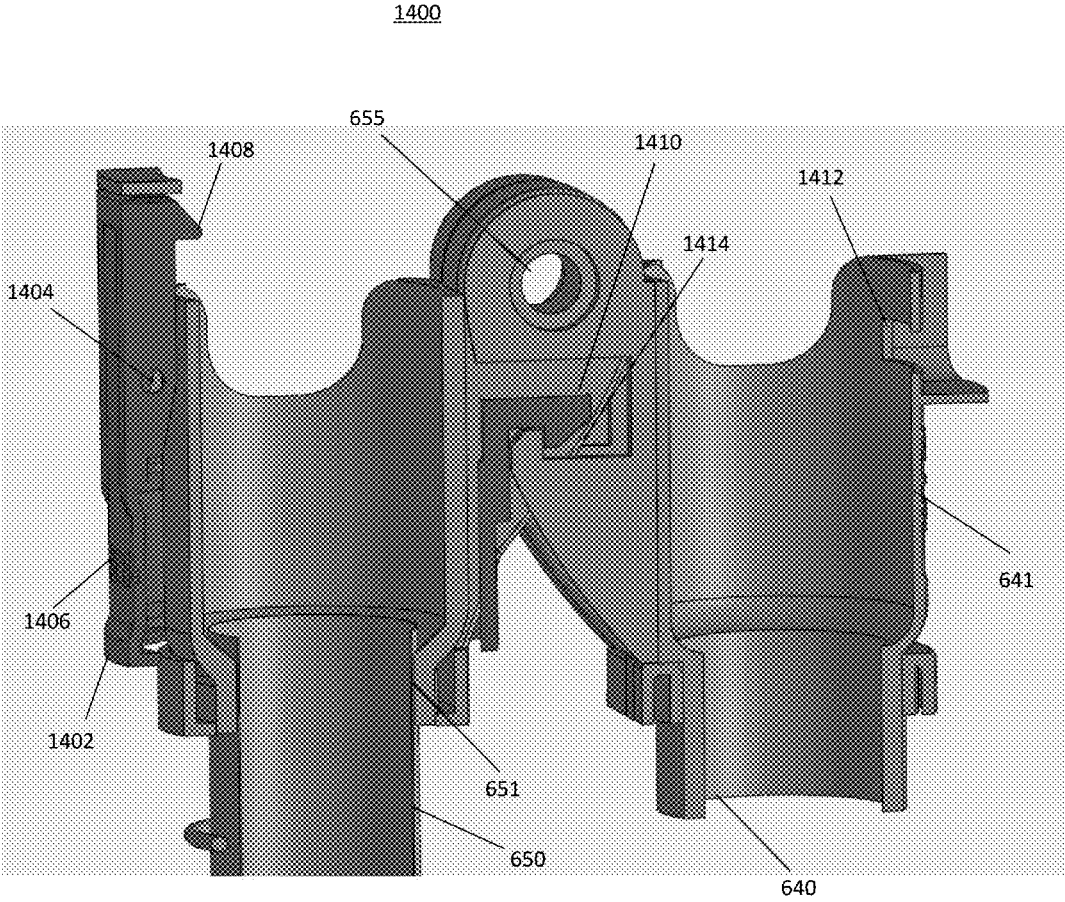


FIG. 16

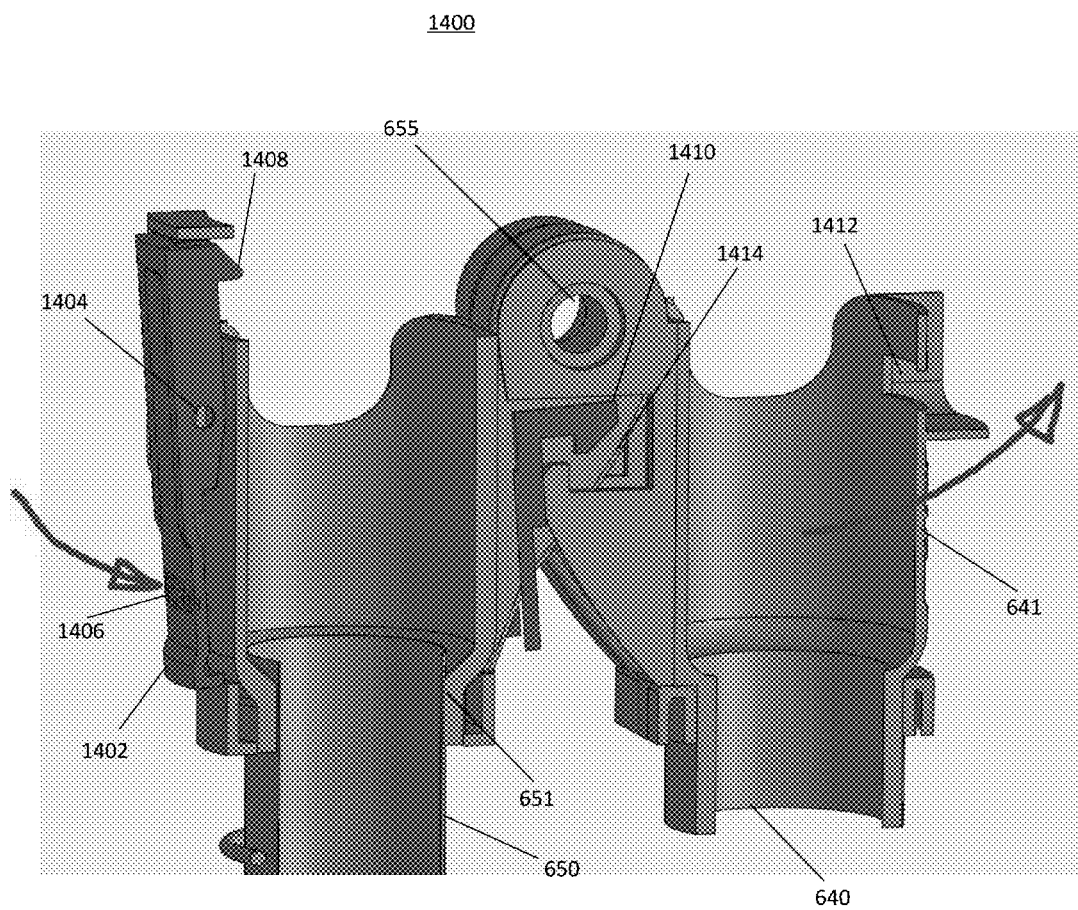
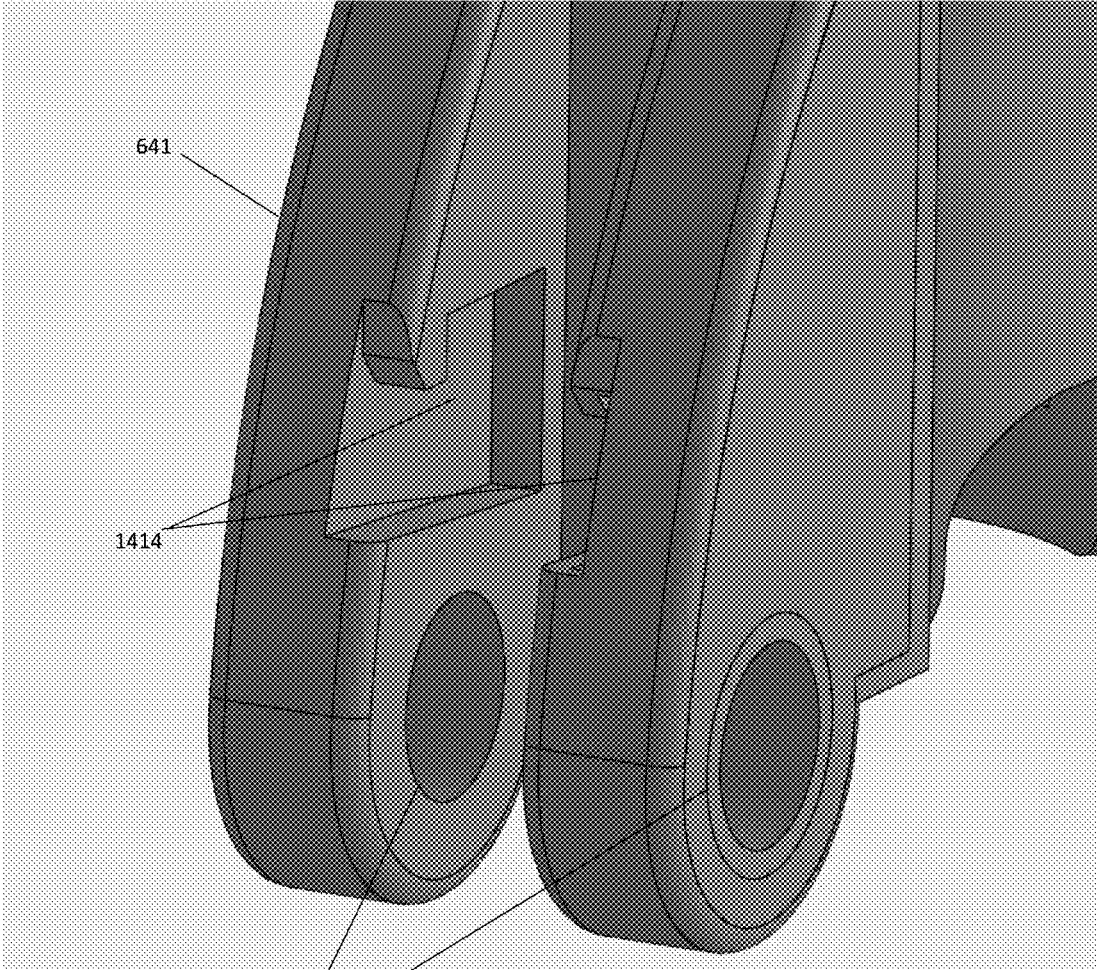


FIG. 17

1400



655

FIG. 18

VACUUM CLEANING DEVICE WITH FOLDABLE WAND TO PROVIDE STORAGE CONFIGURATION

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of co-pending U.S. Provisional Patent Application Ser. No. 62/245,206, filed on Oct. 22, 2015, which is fully incorporated herein by reference.

TECHNICAL FIELD

[0002] The present disclosure relates to vacuum cleaning devices and more particularly, to a vacuum cleaning device with a foldable wand to provide a storage configuration.

BACKGROUND INFORMATION

[0003] Vacuum cleaners devices are used in the home, office and other locations to treat floors and other surfaces. Some vacuum cleaners include a straight, rigid wand between a handle and a surface cleaning head that contacts a surface being cleaned. Some vacuum cleaners may also include a vacuum unit at an opposite end of the wand from the surface cleaning head. The rigidity of the wand often makes it more difficult to use the vacuum cleaner and to store the vacuum cleaner, particularly when a vacuum unit is attached to at an opposite end of the wand.

SUMMARY

[0004] Consistent with an embodiment, a vacuum cleaning device includes a vacuum unit including at least a suction motor, a surface cleaning head including a suction conduit, and a wand having a first end coupled to the vacuum unit and a second end coupled to the surface cleaning head. The wand defines an air passage extending from the first end to the second end and includes a flexible air passage along at least a portion of the wand. The wand includes a plurality of segments pivotably connected together such that the wand is foldable about 180° in a forward direction until the vacuum unit is positioned proximate a top of the surface cleaning head in a storage configuration.

[0005] Consistent with another embodiment, vacuum cleaning device includes a vacuum unit operable to generate vacuum-cleaning suction, a vacuum head, and a wand disposed between the vacuum head and the vacuum unit. The wand includes a plurality of pivotably connected segments. A flexible air passage defines an airway from the vacuum unit to the vacuum head, wherein the vacuum unit is operable to provide vacuum suction to the vacuum head.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] These and other features and advantages will be better understood by reading the following detailed description, taken together with the drawings wherein:

[0007] FIG. 1A is a side view of a vacuum cleaning device with a foldable wand in an upright configuration, consistent with embodiments of the present disclosure.

[0008] FIG. 1B is a side view of the vacuum cleaning device in FIG. 1A in a storage configuration.

[0009] FIG. 2 is a cross-sectional view of a mid-section of the wand taken along line 2-2 in FIG. 1A.

[0010] FIG. 3 is a rear view of another embodiment of a vacuum cleaning device with a foldable wand.

[0011] FIG. 4 is a side view of a further embodiment of a vacuum cleaning device with a foldable wand.

[0012] FIG. 5 is a side view of yet another embodiment of a vacuum cleaning device with a foldable wand showing both the upright configuration and the storage configuration.

[0013] FIG. 6A is a perspective view of an embodiment of a bendable wand joint that may be used in the vacuum cleaning device shown in FIG. 5.

[0014] FIGS. 6B-6D are photographs illustrating the bendable wand joint in FIG. 6A in different bending positions.

[0015] FIGS. 7A-7C are perspective, side and back views, respectively, of another embodiment of a bendable wand joint that may be used in the vacuum cleaning device shown in FIG. 5.

[0016] FIGS. 8A and B are perspective and side views, respectively, of a further embodiment of a bendable wand joint that may be used in the vacuum cleaning device shown in FIG. 5.

[0017] FIGS. 9A and 9B are perspective and side views, respectively, of yet another embodiment of a bendable wand joint that may be used in the vacuum cleaning device shown in FIG. 5.

[0018] FIG. 10 is a side perspective view of a further embodiment of a vacuum cleaning device with a foldable wand.

[0019] FIG. 11 is a side view of a bendable wand joint used in the vacuum cleaning device shown in FIG. 11.

[0020] FIG. 12 illustrates bending of the bendable wand joint shown in FIG. 11.

[0021] FIG. 13 illustrates one embodiment of a vacuum cleaning device including an additional handle.

[0022] FIG. 14 is a partially transparent side view illustrating one embodiment of a single locking mechanism for securing the vacuum cleaning device in a straight position and a storage position.

[0023] FIG. 15 is a cross-sectional view of the single locking mechanism of FIG. 14 for securing the vacuum cleaning device in a straight position and a storage position in an intermediate position.

[0024] FIG. 16 is a cross-sectional view of the single locking mechanism of FIG. 14 for securing the vacuum cleaning device in a straight position and a storage position in a locked, storage position.

[0025] FIG. 17 is a cross-sectional view of the single locking mechanism of FIG. 14 for securing the vacuum cleaning device in a straight position and a storage position in a unlocked, storage position.

[0026] FIG. 18 is a side, end view of illustrating one embodiment of a locking cavity.

DETAILED DESCRIPTION

[0027] Vacuum cleaning devices, consistent with embodiments of the present disclosure, include foldable wands to provide a storage configuration and/or facilitate use. A vacuum cleaning device includes a wand having a first end coupled to a vacuum unit and a second end coupled to a vacuum head or surface cleaning head. The wand defines an air passage allowing air to pass from the surface cleaning head to the vacuum unit and includes a flexible air passage along at least a portion of the wand. The wand also includes a plurality of segments pivotably connected together such that the wand is foldable about 180° in a forward direction

until the vacuum unit is positioned proximate a top of the surface cleaning head, thereby providing a storage configuration.

[0028] FIGS. 1A and 1B depict an illustrative embodiment of a vacuum cleaning device **100** that may be used for cleaning or otherwise treating a floor surface, such as a carpet and/or hard floor. It should be appreciated that the vacuum cleaning devices described herein may be used as treatment devices or appliances that treat or operate on a surface to perform one or more functions.

[0029] As illustrated in FIGS. 1A and 1B, one embodiment of the vacuum cleaning device **100** includes a handle **101**, a vacuum unit **105**, a wand **110**, a vacuum head or surface cleaning head **115**, and a flexible air passage **120**. The vacuum unit **105** may comprise any number of devices suitable for generating suction to pick up dirt, dust, debris and waste. In an embodiment, the vacuum unit **105** may include a motor **107** (shown schematically) for generating suction through a dust cup **109** and a filter **111** (shown schematically) disposed between the dust cup **109** and motor **107** for causing dust materials to be deposited in the dust cup **109**. The vacuum unit **105** may be removably detachable from the wand **110** of the vacuum cleaning device **100**. In such an embodiment, the vacuum unit **105** may be configured for use as a handheld vacuum when detached.

[0030] In some embodiments, the motor **107** may be electrically powered by connection to an electrical outlet, and in other embodiments, the motor **107** may be powered by a battery. The vacuum unit **105** may be integrally or removably attached to the handle **101**. In an embodiment, the motor **107** may comprise any number of cyclone chambers (not shown), such as one, two, three, etc. In an embodiment, the vacuum unit **105** may include any number of dust cups **109**, such as one, two, three, etc. Consistent with an embodiment to be discussed below, for example, the vacuum unit **105** may comprise two dust cups and two cyclones.

[0031] The vacuum head **115** provides the interface between the vacuum cleaning device **100** and the area targeted for vacuuming. Different embodiments of the vacuum cleaning device **100** may comprise different types of vacuum cleaning heads **115**. In the embodiment shown in FIGS. 1A and 1B, the vacuum head **115** includes a roller system **125** rotatably coupled to a housing having a suction conduit opening or mouth **130** and a brush guard **135**. The rollers **125** facilitate movement of the vacuum cleaning device **100**. A variety of different types of roller systems **125** may be used in different embodiments. Other embodiments may employ different means to facilitate movement of the vacuum cleaning device **100**.

[0032] The mouth **130** provides an opening where dust, dirt or other waste may be sucked into a suction conduit of the vacuum cleaning device **100**. Different embodiments may employ different types of designs for the structure of the mouth **130**. The mouth **130** may be defined in an assortment of shapes and sizes and may be divided into more than one opening. The brush guard **135** may also have a variety of different forms in different embodiments.

[0033] The vacuum cleaning device **100** fluidly connects the vacuum cleaning head **115** to the vacuum unit **105** by a flexible air passage **120** (hidden in FIG. 1A and shown in FIG. 1B). The suction created by the vacuum unit **105** can thereby be delivered to the vacuum cleaning head **115**. Dirt, debris, and other waste can be picked up at the vacuum

cleaning head **115** and sucked through the flexible air passage **120**. The flexible air passage **120** may include a hose. Different hoses can be used in different embodiments, and other materials may also be used for the flexible air passage in alternative embodiments.

[0034] In an embodiment, the wand **110** of the vacuum cleaning device **100** is configured to be foldable or collapsible to allow for easy storage and easy expansion for use. In the embodiment shown in FIGS. 1A and 1B, the wand **110** may be connected between the vacuum unit **105** and the cleaning head **115** and defines an air passage including the flexible air passage **120** along at least a portion of the wand **110**. The wand **110** may include a plurality of segments **140**, **145**, **150** pivotably connected to each other. In an embodiment, the wand **110** may include a first segment **140** pivotably connected to a second segment **145**, which in turn, is pivotably connected to a third segment **150**. In an embodiment, the pivot connections may be effected using a first hinge **155** disposed between the first segment **140** and the second segment **145**, and a second hinge **160** disposed between the second segment **145** and the third segment **150**.

[0035] The first hinge **155** may be configured to give the first segment **140** a range of motion around an axis of rotation centered at the first hinge **155**. Similarly, the second hinge **160** may be configured to give the second segment **145** a range of motion around an axis of rotation centered at the second hinge **160**. This allows a user the ability to reshape the vacuum cleaning device **100** for storage or other purposes. Alternatively or additionally, joints, axles, or bearings may be used to pivotably connect the segments.

[0036] Some embodiments of the vacuum cleaning device **100** may have fewer than three segments or more than three segments, such as two, four, five, six, etc. Different embodiments may also include different number of hinges or joints to allow the segments a range of motion. Some embodiments may only have one hinge thereby giving one segment a range of motion, as will be described in greater detail below.

[0037] In some embodiments, the first hinge **155** may be configured to limit the range of motion of the first segment **140** to a predetermined angle of displacement (not shown), such as 90 degrees or 180 degrees. In some embodiments the second hinge **160** may be configured to limit the range of motion of the second segment **145** to a predetermined angle of displacement (not shown), such as 90 degrees or 180 degrees. In some embodiments, both hinges may be configured to limit the range of motion for each segment.

[0038] The angle of displacement for the first hinge **155** may be in the opposite direction as the angle of displacement for the second hinge **160**, for example, as shown in FIG. 1B. In this embodiment, the second segment **145** is rotated forward and the first segment **140** is rotated backwards. As a result, the handle **101** in this embodiment is facing upwards towards a user so that it can conveniently be grabbed.

[0039] In an alternative embodiment not shown, the second segment **145** may be rotated backwards and the first segment **140** may be rotated forward. The handle **101** in this embodiment will also face upward so that it can easily be grabbed by a user. In other embodiments, the first segment **140** and/or the second segment **145** may be able to rotate forwards and backwards.

[0040] The angle of displacement for the first hinge **155** may be in the same direction as the angle of displacement for the second hinge **160** in some embodiments, for example, as

shown in FIG. 4. This permits the first segment 140 to be folded over so that it may be conveniently stored. Some embodiments may also include an additional handle (not shown) or a detachable handle (not shown) so that the first segment 140 may be easily transferred from one position to the next.

[0041] The vacuum cleaning device 100 may also include a locking mechanism (not shown in FIGS. 1A and 1B) to secure the first segment 140 and the second segment 145 into place. Different types of locking mechanisms may be used in different embodiments. Some embodiments may employ a push-button release system to unlock the locking mechanism and free the first segment 140 and second segment 145 for rotation. The push-button release may be actuated by a foot pedal in some embodiments. In some embodiments, both segments may be automatically unlocked simultaneously. In other embodiments, the first segment 140 and the second segment 145 may be unlocked independently.

[0042] In some embodiments, the vacuum cleaning device 100 may have pre-set positions where the first 140 and second segment 145 automatically lock into place. In one embodiment, a first position may correspond to an upright mode where the first segment 140, second segment 145 and third segment 150 are in vertical alignment. Other embodiments may also have other positions.

[0043] The flexible air passage 120 may include a flexible hose extending at least along the second segment 140. As shown in FIG. 2, the second segment 145 may have a U-shaped cross-section such that the flexible air passage 120 is received within the second segment 145 but can move independently from the second segment 145 when pivoted. Because the flexible air passage 120 is not constrained by the second segment 145, the segments 140, 145, 150 may be pivoted to a storage configuration (FIG. 1B) while the flexible air passage 120 flexes and remains connected.

[0044] As shown in FIG. 3, another embodiment of the vacuum cleaning device 100' includes a second segment 145' with two sides 146a, 146b on each side of the flexible air passage 120 and between the hinges 155, 160. This embodiment of the vacuum cleaning device 100' may be moved to a storage configuration similar to the vacuum cleaning device 100 as shown in FIG. 1B, allowing the flexible air passage 120 to flex between the sides 146a, 146b.

[0045] Referring to FIG. 4, another embodiment of a vacuum cleaning device 100" includes a foldable wand 110 that pivots forwardly about 180° such that the vacuum unit 105 is positioned proximate the vacuum head 115, providing a storage configuration. This embodiment of the vacuum cleaning device 100" is similar to the vacuum cleaning device 100 shown in FIGS. 1A and 1B, but the second segment 145 is shorter and the hinge 155 allows pivoting in a forward direction.

[0046] Referring to FIG. 5, a further embodiment of a vacuum cleaning device 500 with a foldable wand is shown and described. The vacuum cleaning device 500 includes a vacuum unit 505, wand 510 and vacuum head or surface cleaning head 515, for example, as described above. In this embodiment, the wand 510 includes first and second rigid segments 540, 550 with a flexible air passage 520 (e.g., hose) extending therebetween. The flexible air passage 520 may extend only between the segments 540, 550 or may extend within the segments 540, 550 to the vacuum unit 505 and the surface cleaning head 515. This embodiment of the

vacuum cleaning device 500 includes a single hinge 555 pivotably coupled to both of the segments 540, 550, forming a bendable wand joint 570.

[0047] The segments 540, 550 may thus be pivoted about the hinge 555 to bend or fold the wand 510 with the flexible air passage 520 flexing between the segments 540, 550. In the illustrated embodiment, the flexible wand joint 570 allows the wand 510 to be folded about 180° such that the vacuum unit 505 is positioned proximate a top of the surface cleaning head 515 in a storage configuration, as shown. This provides for a lower center of gravity in the storage configuration to facilitate handling and storage of the vacuum cleaning device 500. The flexible wand joint 570 also allows the wand to bend during use, for example, to allow the wand to be lowered without requiring the user to bend over as much. This may prevent strain on the back of the user during use.

[0048] The vacuum cleaning device 500 may also include an additional handle 502 that may be used in the storage configuration. In some embodiments, as shown, the additional handle 502 is coupled between the segments 540, 550 in the storage configuration. The additional handle 502 may be pivotably mounted on one segment 550 and then pivoted into engagement with the other segment 540.

[0049] One example of an additional handle 502 consistent with at least one embodiment of the present disclosure is generally illustrated in FIG. 13. As may be seen, the additional handle 502 may be coupled to and/or located proximate to at least a portion of the first segment 540. For example, the additional handle 502 may extend from a first to an opposite side (e.g., a left to a right side), and may be located proximate the vacuum unit 505 (e.g., closer to the vacuum unit 505 than the single hinge 555). This location of the additional handle 502 provides numerous unexpected benefits. For example, the location of the additional handle 502 is lower down on the vacuum cleaning device 500 when in the folded position of FIG. 13, thereby allowing users to lift the vacuum cleaning device 500 off the ground more easily, particularly if the user is shorter. The location of the additional handle 502 also at the preferred height when the vacuum cleaning device 500 is folded to facilitate carrying the vacuum cleaning device 500 up stairs. Moreover, the location of the additional handle 502 allows for a wider carrying surface as the bulk of the additional handle 502 is hidden by the connector when looking front on. The joint remains slim from the front as most of the bulk of the additional handle 502 is at the top. The location of the additional handle 502 facilitates lifting the vacuum cleaning device 500 from the folded (e.g., storage) position to the straight position. Without a lifting handle 502, users may unfold the vacuum cleaning device 500 from the handvac handle (which undesirably requires a user to bend to the floor), the dustcup (which is uncomfortable and may lead to accidental dustcup release), and/or the pole (not intuitive and higher lever forces so wanted to hold lower down). As noted, all of these alternative methods suffer from disadvantages which the additional handle 502 in the location of FIG. 13 addresses.

[0050] As mentioned above, the vacuum unit 515 may be battery powered or may be connectable to an external power source by a cord. The vacuum unit 515 may include a rechargeable battery, which may be charged when in the storage configuration and without removing the vacuum unit 515. For example, the charging contacts or connection on the

vacuum unit **515** may be in a position on the vacuum unit **505** that allows the vacuum unit **515** to be connected to a charging unit when in the storage configuration.

[0051] An embodiment of a bendable wand joint **670** that may be used with the vacuum cleaning device **500** is shown in greater detail in FIGS. 6A-6D. The bendable wand joint **670** includes a first hinge member **641** at an end of a first wand segment **640** and a second hinge member **651** at the end of a second wand segment **650**. The hinge members **641**, **651** are pivotably coupled at hinge **655**. A flexible hose **620** extends between the hinge members **641**, **651** and wand segments **640**, **650**. When the hinge members **641**, **651** pivot about the hinge **655**, the flexible hose **620** flexes as shown in FIGS. 6C and 6D.

[0052] A first locking mechanism **675** may hold the hinge members **641**, **651** together to lock the bendable wand joint **655** (e.g., in an extended or straight position as shown in FIG. 6A). This embodiment of the locking mechanism **675** includes a locking arm **677** extending from one hinge member **641** to engage a structure on the other hinge member **651**. The first locking mechanism **675** may include a release button **679**, which may be pressed to cause the locking arm **677** to disengage and unlock, as shown in FIG. 6B.

[0053] A second locking mechanism **680** may hold the hinge members **641**, **651** together to lock the bendable wand joint **655** in a different position (e.g., in a folded position for a storage configuration as shown in FIG. 6D). This embodiment of the second locking mechanism **680** includes a locking arm **683** that extends from one hinge member **651** to engage a structure on the other hinge member **641**. Other locking mechanisms may also be possible and are within the scope of the present disclosure.

[0054] With reference now to FIGS. 14-18, another embodiment of a locking mechanism **1400** is generally illustrated. As explained herein, the locking mechanism **1400** is a single locking mechanism that performs the locking functions of both the first locking mechanism **675** and the second locking mechanism **680**, i.e., the locking mechanism **1400** may hold the hinge members **641**, **651** together to lock the bendable wand joint **655** in an extended or straight position) and may also hold the hinge members **641**, **651** together to lock the bendable wand joint **655** in a folded position for a storage configuration. It should be appreciated that the bendable joint **655** may include a flexible hose **620** (not shown in FIGS. 14-18 for clarity) that is similar to the flexible hose **620** of FIG. 6.

[0055] The locking mechanism **1400** includes a locking collar or the like **1402** which may be pivotally coupled to the second hinge member **651** about a pivot point **1404** (though it should be appreciated that locking collar **1402** may be pivotally coupled to the first hinge member **641**). The locking collar **1402** may include at least one release button **1406** and a first and a second locking arm **1408**, **1410**. In the illustrated embodiment, the locking arms **1408**, **1410** are configured to mechanically engage with a first and a second corresponding locking cavity **1412**, **1414** formed in the first hinge member **641** (again, it should be appreciated that this arrangement may be reversed if the collar **1402** was pivotally coupled to the first hinge member **641**) to secure (e.g., lock) the hinge members **641**, **651** in the straight position and storage positions, respectively. According to one embodiment, the locking arms **1408**, **1410** may include a locking pawl, hook, or the like that latches with a portion of

the corresponding locking cavity **1412**, **1414** to secure the first and second hinge members **641**, **651** in the desired position (e.g., straight or folded positions). Optionally, the locking collar **1402** may include a biasing device (such as, but not limited to a spring or the like, not shown for clarity) that urges the locking collar **1402** to a default locking position. The default locking position may correspond to a position in which the locking arms **1408**, **1410** are secured to the corresponding locking cavity **1412**, **1414** when in either the straight or folded positions, respectively.

[0056] To move the hinge members **641**, **651** from the current position to the alternative position, the user may press (e.g., urge) the release button **1406** inwardly against the biasing device which causes the locking arms **1408**, **1410** to pivot and release from its respective locking cavity **1412**, **1414**, thereby allowing the user to move hinge members **641**, **651** from one position to the other. Once in the new position, the locking arm **1408**, **1410** corresponding to the new position will mechanically engage (e.g., lock) with the corresponding locking cavity **1412**, **1414**.

[0057] In at least one embodiment, the back saver of the present disclosure may be configured to automatically lock when folded into the storage position and automatically unlock by applying sufficient force (e.g., outward force) to lift the back saver out of the storage position into the use position (e.g., straight position).

[0058] FIGS. 7A-7C, 8A-8B, and 9A-9B illustrate other embodiments of bendable wand joints that may be used with the vacuum cleaning device **500** shown in FIG. 5. In further embodiments, the vacuum cleaning device **500** with a foldable wand shown in FIG. 5 may also be implemented using a reconfigurable airflow wand as described in U.S. Pat. No. 8,296,901, which is commonly owned and fully incorporated herein by reference.

[0059] Referring to FIGS. 10-12, a further embodiment of a vacuum cleaning device **1000** with a bendable wand is shown and described. In this embodiment, the vacuum cleaning device **1000** includes a bendable wand joint **1070** including a locking mechanism **1075** with a sliding actuator **1079** for releasing a locking arm **1077**. As described above, the bendable wand joint **1070** is located between segments **1040**, **1050** of a wand **1010**. The wand segments **1040**, **1050** are coupled to a vacuum unit **1005** and a surface cleaning head **1015**, respectively, and a flexible hose **1020** extends at least between the wand segments **1040**, **1050**. The sliding actuator **1079** may include an over-molded sleeve around the wand segment **1040**. The user may pull the sleeve of the sliding actuator **1079** toward the vacuum unit **1005** to cause the locking arm **1077** to release and allow the bendable wand joint **1070** to bend. As shown in FIG. 10, the bendable wand joint **1070** allows the wand segments **1040**, **1050** to pivot about 180° such that the vacuum unit **1005** may be positioned proximate a top of the surface cleaning head **1015** in a storage configuration.

[0060] Accordingly, a vacuum cleaning device with a bendable wand, consistent with the present disclosure, may help reduce back strain during use while also facilitating storage.

[0061] Words of comparison, measurement, and timing such as "at the time," "equivalent," "during," "complete," and the like should be understood to mean "substantially at the time," "substantially equivalent," "substantially during," "substantially complete," etc., where "substantially" means that such comparisons, measurements, and timings are prac-

ticable to accomplish the implicitly or expressly stated desired result. Words relating to relative position of elements such as “about,” “near,” “proximate to,” and “adjacent to” shall mean sufficiently close to have a material effect upon the respective system element interactions.

[0062] While the principles of the invention have been described herein, it is to be understood by those skilled in the art that this description is made only by way of example and not as a limitation as to the scope of the invention. Other embodiments are contemplated within the scope of the present invention in addition to the exemplary embodiments shown and described herein. Modifications and substitutions by one of ordinary skill in the art are considered to be within the scope of the present invention, which is not to be limited except by the following claims.

What is claimed is:

1. A vacuum cleaning device comprising:
a vacuum unit including at least a suction motor;
a surface cleaning head including a suction conduit;
a wand having a first end coupled to the vacuum unit and a second end coupled to the surface cleaning head, the wand defining an air passage extending from the first end to the second end and including a flexible air passage along at least a portion of the wand, wherein the wand includes a plurality of segments pivotably connected together such that the wand is foldable about 180° in a forward direction until the vacuum unit is positioned proximate a top of the surface cleaning head in a storage configuration.
2. The vacuum cleaning device of claim 1 wherein the wand includes first and second rigid segments and a hinge between the first and second rigid segments
3. The vacuum cleaning device of claim 2 further comprising a flexible tube between the first and second rigid segments providing the flexible air passage.
4. The vacuum cleaning device of claim 3 further comprising a locking mechanism for locking the first and second rigid segments in at least an extended, unfolded position.
5. The vacuum cleaning device of claim 2 further comprising a locking mechanism for locking the first and second rigid segments in at least an extended, unfolded position.
6. The vacuum cleaning device of claim 5 wherein the locking mechanism includes a locking arm coupled to one of the segments for engaging a structure coupled to another of the segments.
7. The vacuum cleaning device of claim 1 wherein the wand includes first, second and third segments, a first hinge between the first and second segments and a second hinge between the second and third segments.
8. The vacuum cleaning device of claim 7 further comprising a flexible tube between the first and third rigid segments providing the flexible air passage.
9. The vacuum cleaning device of claim 1 further comprising a first locking mechanism for locking the segments in an extended position and a second locking mechanism for locking the segments in a folded position.

10. The vacuum cleaning device of claim 1 further comprising an additional handle configured to be coupled between at least two of the segments in the storage configuration.

11. A vacuum cleaning device, comprising:

- a vacuum unit operable to generate vacuum-cleaning suction;
- a vacuum head;
- a wand disposed between the vacuum head and the vacuum unit, wherein the wand comprises a plurality of pivotably connected segments; and
- a flexible air passage defining an airway from the vacuum unit to the vacuum head, wherein the vacuum unit is operable to provide vacuum suction to the vacuum head.

12. The device of claim 11, wherein:

- the plurality of pivotably connected segments of the wand comprise a first segment, second segment, and a third segment, wherein the second segment is disposed between the first and third segments;
- a first hinge located between the first and second segments, wherein the first segment is operable to rotate about a first axis passing through the first hinge;
- a second hinge located between the second and third segments, wherein the second segment is operable to rotate about a second axis passing through the second hinge; and
- a locking mechanism configured to releasably lock the first and second segments into a plurality fixed positions.

13. The device of claim 12, wherein the vacuum unit is removably attachable to the wand and operable, when detached, to be used as a handheld vacuum.

14. The device of claim 13, wherein the wand has a first position, in which the first, second and third segments are fixed along a longitudinal axis by the locking mechanism, and a second position, in which the first segment is displaced from the longitudinal axis by a first angle of rotation and the second segment is displaced from the longitudinal axis by a second angle of rotation.

15. The device of claim 14, wherein the first angle of rotation and the second angle of rotation have the same rotational direction.

16. The device of claim 14, wherein the first angle of rotation and the second angle of rotation have the opposite rotational direction.

17. The device of claim 11, wherein the flexible air passage comprises a hose.

18. The device of claim 17, wherein the hose comprises a first end removably attachable to the vacuum head, and a second end removably attachable to the vacuum unit, wherein the vacuum unit is operable to provide vacuum-cleaning suction to the first end when the first end is detached from the vacuum head.

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